

Lesson 1



Heron eating fish in polluted river

The Tijuana River: A Shared Resource

Problems surrounding the Tijuana River make the health of the watershed a transboundary environmental issue requiring international attention. In this lesson, students brainstorm ideas about the relations between the United States and Mexico in terms of environmental issues.

The students list the environmental problems shared by the United States and Mexico that have links to economics, politics, and immigration. The students record their ideas and categorize the issues. Their work serves as the basis for a class discussion about the bigger picture

regarding the relations between the United States and Mexico. It also gives the teacher insight into students' prior knowledge and opinions about these issues.

Students independently read an article about the natural and human social systems in the Tijuana River

watershed. Following the reading, they organize their thoughts about and discuss the issues presented in the article. Students come to understand that the Tijuana River provides an excellent case study of the environmental issues jointly facing the United States and Mexico.

Learning Objective

Identify key environmental issues that influence the relations between the United States and Mexico.

Provide examples of environmental impacts that are not contained by the political boundaries between the United States and Mexico.



sewage system, under pressure from substantial population growth, frequently spills raw sewage into local streams and the Pacific Ocean. At the same time, an expanding population in Tijuana, faced with limited or a complete lack of waste management and sewage treatment facilities, has been dumping solid waste and sewage into the Tijuana River. The waste and sewage have affected the farmland in the river valley on both sides of the border, making the land completely unsuitable for agricultural production. The sewage in the river has made its way to the coast, contaminating both nations' beaches, estuaries, and coastal waters.

Background

The southern portion of the State of California and the entire Mexican state of Baja California lie in a coastal desert ecosystem where the human population has rapidly increased over the last 20 years, making the availability and quality of fresh water major issues. Some of the largest cities in these states—San Diego and Tijuana—occupy an increasing amount of this desert area and must import most of their water from distant sources. Although both share their names with nearby rivers, neither river serves as a source of water for either city. Instead, the cities have historically used these rivers for stormwater and wastewater management.

The quality and quantity of the water in the Tijuana and San Diego Rivers have changed as the cities have grown. Once seasonal, these rivers now run year-round with water draining from inland areas to the ocean. Where the quantity of water overall has increased in the rivers, the quality of the water has decreased over time. Urbanization and industrialization in both cities over the past decade have led directly to this decline in water quality. Water quality has directly affected the health of the riparian and coastal ecosystems in the border region of both states.

San Diego has failed to meet the federal Clean Water Act standards for more than two decades as its aging

Key Vocabulary

Border region: A 62-mile (100-kilometer) wide area along the U.S.-Mexico international border, stretching 1,956 miles (3,148 kilometers) from California to the southern tip of Texas.

Infrastructure: The systems and facilities that are necessary for a human community to function. Infrastructure includes roads, sewage and water treatment plants, and power stations.

Industrialization: The changing of an area by creating industry, such as factories and power plants.

Maquiladora: Mexican corporations that operate under a special program. Maquiladoras can be assembly plants, manufacturing facilities, food packing plants, or even call centers.



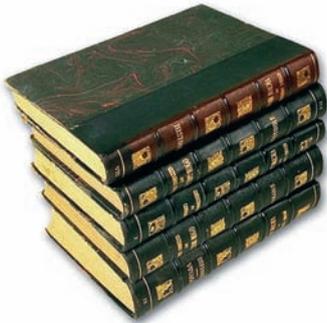
Chemical waste drums

Toolbox



Summary of Activities

Students brainstorm problems and issues that influence relations between the United States and Mexico. They read and discuss an article about the environmental issues involving the Tijuana River watershed and consider how these issues influence life in the border region.



Instructional Support

See Extensions & Unit Resources, page 32

Prerequisite Knowledge



Students should know about:

- the general geography and location of the United States and Mexico.

Advanced Preparation



Gather and prepare Activity Masters.

Gather and prepare Materials Needed.

Gather and prepare Visual Aids.

Prepare “Problems and Issues” Chart:

- On the board, make a two-column chart with “Problems” at the top of one column and “Issues” at the top of the other. The columns should each be wide enough to fit a 3”x3” or bigger self-adhesive note.



Materials Needed



Activity supplies:

- Self-adhesive notes (3"x3" or larger): three to five per student

A-V equipment:

- Overhead or LCD projector, screen

Class supplies:

- Pencils or pens

Visual Aids



Transparencies:

- **Border Region Map**, Visual Aid #1

Duration



Preparation Time

15 min.

Instructional Time

55 min.



Safety Notes

None

Activity Masters in the Supporting Materials (SM)

Key Unit Vocabulary

SM, Pages 8–9
One per student

California Connections: The Tijuana River—Part 1: A Shared Resource

SM, Pages 10–13
One per student

Notes on the Tijuana River

SM, Page 14
One per student

Procedures

Vocabulary Development

As appropriate, in each lesson introduce new vocabulary words using the **Key Unit Vocabulary** (Lesson 1 Activity Master).

Step 1

Ask students to explain the difference between an “issue” and a “problem.” (*Answers will vary.*) Use students’ input to help them understand that a “problem” is a situation that is difficult, or that causes difficulties. People can solve a problem. An “issue,” in contrast, is a subject of discussion. Issues arise when people disagree about the ways to solve a problem. People can discuss and resolve issues. Ask the class to give examples of problems and issues. (*Problem—a budget deficit, issue—government spending; problem—students not graduating, issue—education; problem—water pollution, issue—water quality*)

Step 2

Give each student three self-adhesive notes. Display the **Border Region Map** (Visual Aid #1) on the overhead or LCD projector. Have students write down three things about the region displayed on the map, writing each item on a separate self-adhesive note; students can write things they already know or things they learn by looking at the map. (*The Rio Grande River is part of the border between the United States and Mexico; immigrants cross the border from Mexico into the United States.*) Give students about 10 minutes to write three things they know about this region.

Step 3

Next, direct each student to choose one of the things written on the self-adhesive notes and decide if the item is an issue or a problem in the border region. Have students come up two at a time to place their sticky notes in one of the columns on the **Problems and Issues Chart**, depending on whether the topic is a problem or an issue.

Step 4

When each student has placed a sticky note on the chart, read off the topics posted on the chart and let the class confirm whether each is in the correct column, “Problem” or “Issue.” Move topics from one column to another to correct any that are misplaced. If the same topic appears on multiple sticky notes, place those notes one on top of the other in the same column.

Step 5

Choose one of the following options:

If students did not list the environment as an issue in the border region and or mention pollution as a problem, ask the class if they think environmental problems affect life in the border region or if the environment is an issue that affects the relationship between the United States and Mexico. (*Yes*) If no sticky notes reflecting the environment appear under the “Issues” column, add one. Tell students that over the next several lessons, they will be learning about environmental issues that are associated with the border region and affect U.S.-Mexico relations.

If students listed the environment as an issue, point it out to students and tell them that over the next several lessons, they will be learning about the environmental issues that influence U.S.-Mexico relations.

If students did not list the environment as an issue but placed topics under the “Problem” column that suggest they were thinking about it (for example, they might have mentioned pollution, trash, smog/smoke, sewage), write “environment” on a sticky note and add it to the “Issue” column. Point out to students that problems like pollution, trash, and sewage relate to the issue of the environment. Tell them that over the next several lessons, they will be learning about the environmental issues that are associated with the border region and affect U.S.-Mexico relations.



Step 6

Distribute copies of *California Connections: The Tijuana River—Part 1: A Shared Resource* (Lesson 1 Activity Master) and **Notes on the Tijuana River** (Lesson 1 Activity Master) to each student.

Have students read *California Connections: The Tijuana River—Part 1: A Shared Resource*. As they read the story, have them complete the concept map on the **Notes on the Tijuana River** worksheet. Tell students to wait to answer the questions until after the class has discussed the article.

Step 7

When students are done reading have a class discussion using the following questions as the starting point:

- What are the main problems mentioned in the article? (*The Tijuana River is highly polluted with raw sewage, industrial waste, and garbage; this pollution influences the people and natural environment in the area. Urbanization, industrialization, and population growth cause this pollution.*)
- How are these problems connected to the environment? (*The sewage and other byproducts in the water, as well as erosion from new housing, influence the Tijuana River Estuary and change the coastal systems.*)
- How are these problems connected to the economy? (*Some reasons for the reduction in water quality have to do with the economy. The infrastructure in the area, for waste water treatment and the management of industrial wastes, is either non-existent or limited. Improving the infrastructure would cost money. The maquiladoras are a source of employment for Mexicans, and they also contribute to the economy in the United States. It may seem to be cheaper in the short term to dump industrial waste into the soil and water rather than create new wastewater treatment facilities.*)
- How are these problems connected to politics? (*These problems require both countries to communicate and discuss the possible solutions and economic consequences.*)

Step 8

After the class discussion, have students complete the concept maps on **Notes on the Tijuana River**.

Step 9

Ask students to name an additional issues that may not already be listed in the “Issues” column on the board (*Industrialization, infrastructure, sewage treatment, potable water*). Then ask students to name those that may be problems that should be added to the “Problems” column. (*Maquiladoras, debris, trash*) Have student volunteers place each of these on a sticky note and put it in the appropriate column on the board.

Step 10

Have students answer the guiding questions on **Notes on the Tijuana River**. When they have finished, collect the copies of *California Connections: The Tijuana River—Part 1: A Shared Resource*. Collect the **Notes on the Tijuana River** from each student and use in assessment.

Lesson Assessment

Description

This lesson teaches students that environmental issues influence the relationship between the United States and Mexico and gives details related to one example—the Tijuana River. Students complete a concept map to demonstrate their understanding of how the environmental issues in and around the Tijuana River relate to problems (environmental impacts) that are not contained by the countries' political boundaries. Their answers to the questions on **Notes on the Tijuana River** (Lesson 1 Activity Master) demonstrate that they can identify the health of the Tijuana River as an environmental issue that influences life in the border region and, therefore, the relations between the United States and Mexico.

Suggested Scoring

Use the Answer Key and Sample Answers on page 41 to assess student work.

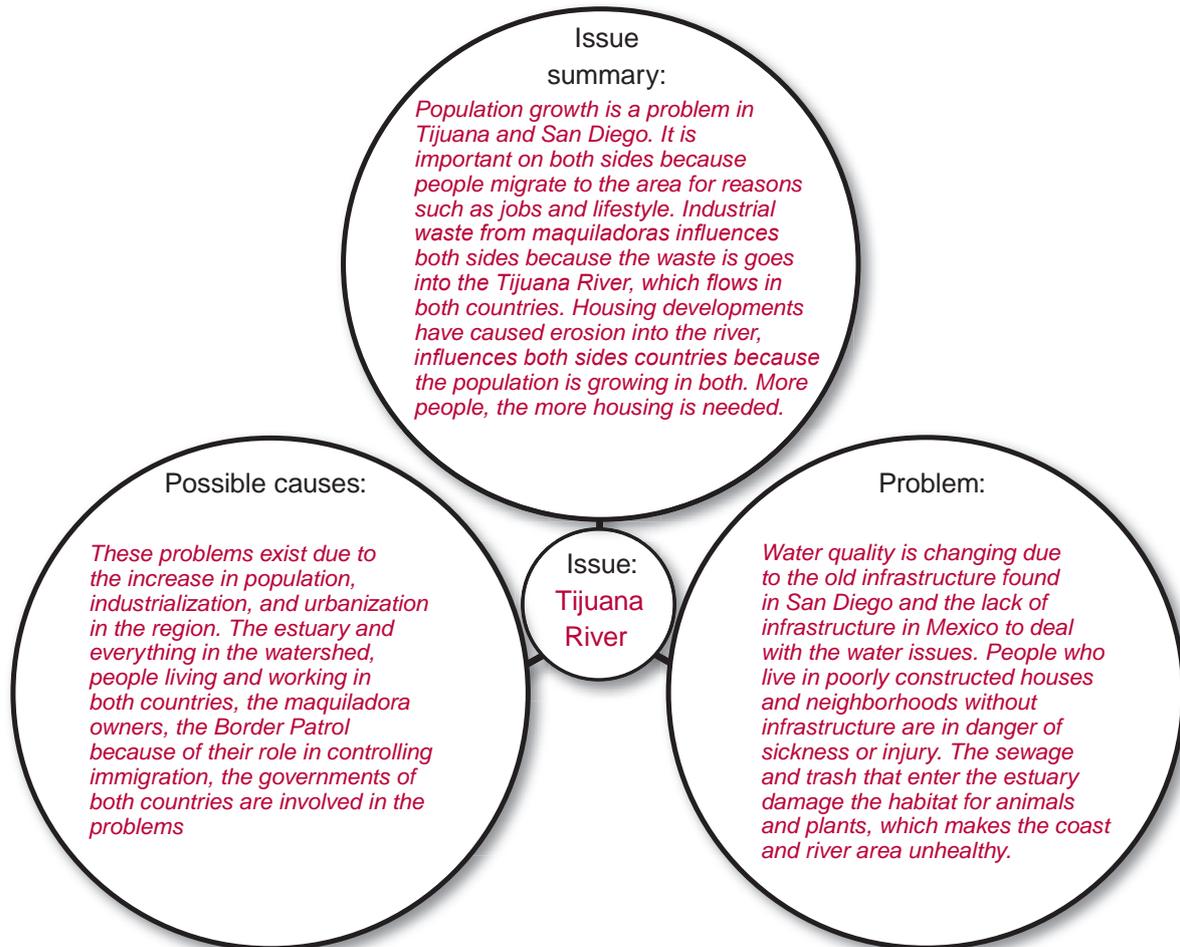
Each question on **Notes on the Tijuana River** is worth 10 points. Each completed circle is worth 20 points. The total possible score is 90 points.

Answer Key and Sample Answers

Notes on the Tijuana River

Lesson 1 Activity Master

Name: _____



Questions to Answer After Class Discussion:

1. Why are the problems in the Tijuana River watershed important to both the United States and Mexico? _____

2. Why do the problems exist? What or who is/are directly involved in the problems? _____

3. How do these problems influence life in the border region? _____

Key Unit Vocabulary

Lesson 1 Activity Master | page 1 of 2

Allocation: Something, such as shared funds, that is distributed to individuals or groups according to a plan and specific purpose.

Aquifer: An underground layer of rock or sediment that holds usable amounts of groundwater.

Border region: A 62-mile (100-kilometer) wide area along the U. S.-Mexico international border, stretching 1,956 miles (3,148 kilometers) from California to the southern tip of Texas.

Convention: An agreement between nations.

Domestic: Relating to the home or everyday life in a household or in one's home country.

Emissions: The release of substances such as gases or particulates that contribute to air pollution. Other forms of emissions include noise, vibrations, light, heat, radiation, and odors.

U.S. Environmental Protection Agency: The U.S. government agency that implements federal laws designed to promote public health by protecting air, water, and soil from pollution.

Indigenous (or native): Originating in a particular region or country.

Industrialization: The changing of an area by creating industry, such as factories and power plants.

Infrastructure: The systems and facilities that are necessary for a human community to function. Infrastructure includes roads, sewage and water treatment plants, and power stations.

Lead: A heavy, highly toxic, bluish gray metallic element that bends easily and is used in car batteries, pipes, solder, and radiation shields.

Maquiladora: Mexican corporations that operate under a special program. Maquiladoras can be assembly plants, manufacturing facilities, food packing plants, or even call centers.

Median household income: A statistical value that divides household income into two segments: one half the population earning less than the median household income and the other half earning more.

Municipal: Relating to a town, city, or region that governs itself.

Outreach: Providing information or services to groups in society who otherwise might not have access to such information or services.

Particulate matter: Tiny particles of liquid and solids suspended in the atmosphere.

Population density: The measurement of population per unit area. Human population density is typically measured in units of people per square miles or kilometers.

Poverty rate: An estimated percentage of people lacking the income (money) necessary to meet their basic needs for health (food, shelter, clothing, and medical care).

Key Unit Vocabulary

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Restoration: The process of returning something, from a work of art to an ecosystem, to an earlier or better condition. Ecological restoration is usually targeted at ecosystems that have been degraded, transformed, or destroyed as the result of human activities.

Salinity: The total amounts of salts dissolved in water. The average salinity of sea water is 35 parts per thousand.

Secretaria de Medio Ambiente y Recursos Naturales (SEMARNAT): The Mexican government agency that encourages the protection, restoration, and preservation of ecosystems, natural resources, and environmental goods and services.

Stakeholders: Individuals, groups, or organizations that have a vested interest in a particular action or decision.

Stewardship: Careful and responsible management of land, air, water, and biodiversity to ensure healthy and fully functioning ecosystems.

Treaty: An agreement or protocol between two or more nations to create or restrict rights and responsibilities.

Watershed: The region of land that drains water into a particular watercourse or body of water.

The Tijuana River

Part I: A Shared Resource



If you walk along the sand at Imperial Beach, along with gulls and sunbathers you are likely to see bleach bottles, plastic toys, hypodermic needles, tires, oil containers, or even a refrigerator door. You also might see a yellow sign that says *Keep Out! Sewage Contaminated Water. Exposure May Cause Illness.* The San Diego County Department of Environmental Health closed the beach at the mouth of the Tijuana River for a total of 198 days in 2006. Environmental problems cross political borders at this special place where land, river, and ocean merge with two socially and economically disparate countries.

The Tijuana River is a trans-boundary watershed, with drainages running across the border between the United States and Mexico. Most of the river flows through Mexico, where it passes the cities of Tecate and Tijuana. It enters the United States 3 miles (4.8 kilometers) before draining into the Pacific Ocean. The river meets the sea at the protected Tijuana River National Estuarine Research Reserve. This diverse ecosystem lies at the junction of terrestrial, freshwater, and marine habitats. The reserve provides refuge for several threatened and endangered species.



Surfer on contaminated beach

Years ago, hiking upstream from the reserve, you might have been able to see dolphins and deer in the same day; however, those mammals are no longer found in the estuary.

Today, human activities threaten the Tijuana River watershed, which is designated as a biodiversity hotspot and a “Wetland of International Importance.” The area is home to many species with limited distribution or small populations that face immediate threat.

Experts think that Tijuana’s current population of 1.5 million will double by 2020. San Diego’s population will increase by 1.3 million. This rapid growth means that more people will need homes, water, and places to dispose of wastes. Rapid growth is a particular problem for Mexico because it lacks infrastructure like adequate facilities for wastewater.

Citizens of both countries move to the border region seeking work. Migration to the region has grown since the mid-1990s, when passage of the North American Free Trade Agreement (NAFTA) allowed the United States and Mexico to trade with



wastewater flowing—Los Laureles Canyon, Tijuana, Mexico

limited tariffs. NAFTA led to an explosion in the number of maquiladoras—assembly plants. Many of these plants are American-owned factories, operating on the

Mexican side of the border. There the owners can take advantage of Mexico’s lower wages and more abundant labor supply, as well as less stringent enforcement of

California Connections: The Tijuana River—Part 1: A Shared Resource

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Illegal dumping and wastewater—Tijuana, Mexico

environmental regulations. Most of the profits from the maquiladoras flow back across the border to American and multinational corporations.

Money is not the only thing that flows across the border. The byproducts of manufacturing flow into the river. And, Mexico lacks the infrastructure, funds, and environmental regulation to deal effectively with the industrial waste and toxic chemicals dumped on soil and into waterways. These toxins travel downstream, polluting both surface water and groundwater, as well as the coastal waters of the Pacific Ocean. Scientists have detected high levels of

heavy metals in the river. As these metals move through food chains, they accumulate in the tissues of animals



Heron eating fish in polluted water

including humans.

The growing need for housing is another problem resulting from economic growth in the region. Many housing developments have been built on crumbling hillsides above the river. Their construction has removed the vegetation that holds the hillsides in place. When rain falls, water runs off the concrete, rather than soaking into the ground. The resulting volume and velocity of water erode the hillsides and carry the soil into the river. This sediment load pulses into the

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to bury the estuary in a layer of silt.

Sediment is not the only thing flushed downriver during a storm. Because Tijuana lacks adequate sewage treatment, with each rainstorm a million gallons of raw sewage overflow downstream from Tijuana. This enormous load of organic waste poses a human health problem. The torrents also sweep trash, plastics, and even discarded appliances into the river.

Debris overwhelms the border fence. The drainage gates in Smuggler's Gulch and Goat Canyon are open all the time, allowing the current to carry debris downstream, where it pollutes the estuary, litters the beach, and flows out to sea, causing even more problems. The water and sediment that flows into Goat Canyon is caught by large sedimentation basins at the head of the canyon on the U.S. side. The problems do not stem only from Mexico. Wastewater infrastructure in San Diego is old and in disrepair. Population growth in San Diego further stresses an overburdened system.

Environmental changes on one side of the border

do not stay there. The river flows across the international border without regard to municipal infrastructures, and environmental and economic regulations. What enters the

river upstream always flows downstream. Because of this, neither Mexico or the United States can solve these problems without working together.

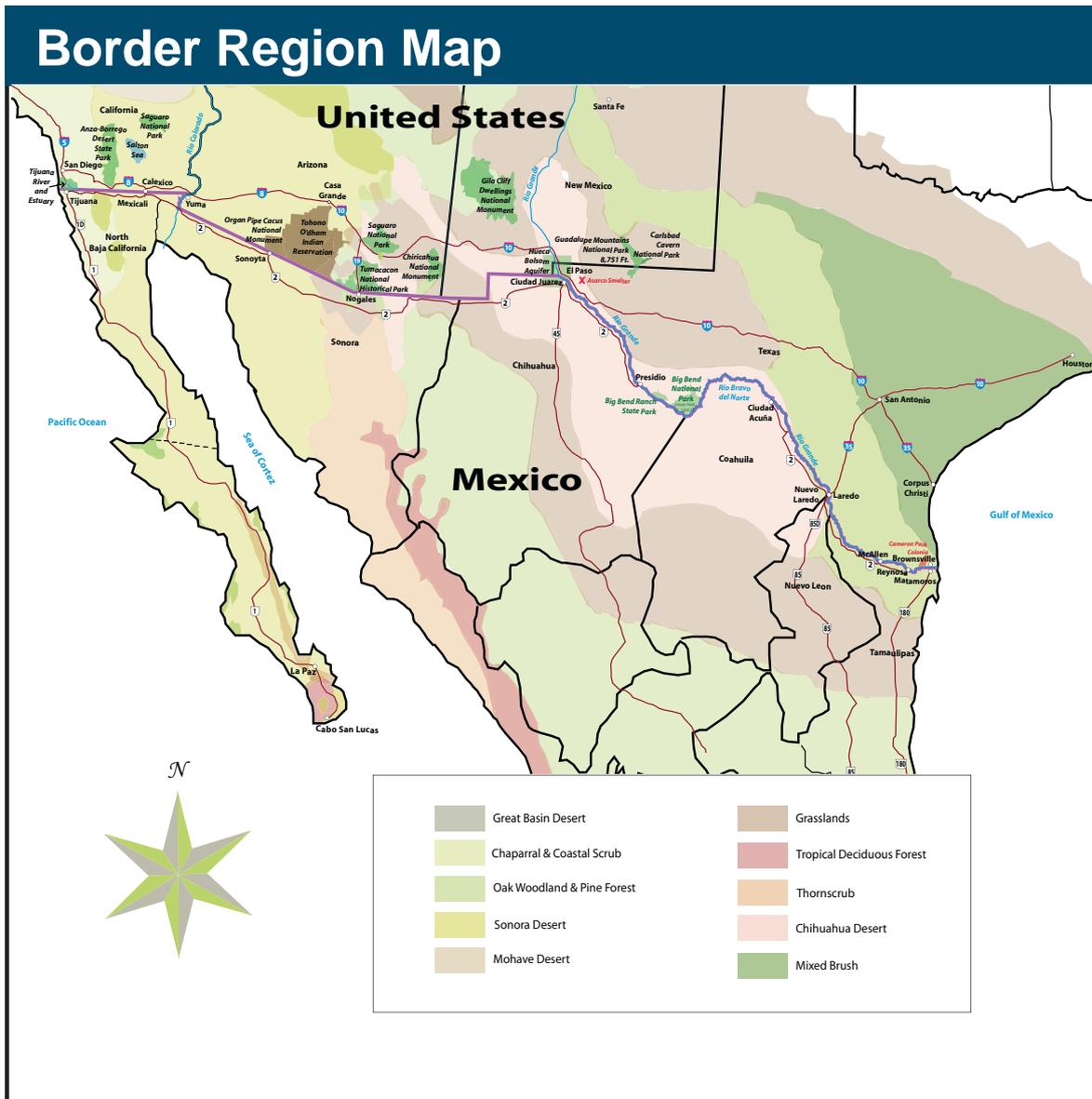


Trash on beach, Imperial Beach, California

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Border Region Map

Visual Aid — Transparency





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